

**WHAT WE CLAIM IS:**

1. A liquid crystal display device using a hologram,  
characterized in that a liquid crystal display element is  
provided on a display surface side thereof with a diffuse  
transmission type hologram capable of diffusing and  
transmitting light incident from a specific direction only in  
a direction defined as a viewing region.

2. The liquid crystal display device using a hologram  
according to Claim 1, characterized in that a scatter plate  
is located between the liquid crystal display element and a  
backlight.

3. A liquid crystal display device using a hologram,  
characterized in that between a liquid crystal display  
element and a backlight there is located a diffuse  
transmission type hologram capable of diffusing and  
transmitting light incident from a specific direction only in  
a direction defined as a viewing region.

4. The liquid crystal display device using a hologram  
according to any one of Claims 1 to 3, characterized in that  
the diffuse transmission type hologram has a property of  
diffusing and transmitting light only in a direction defined  
as a viewing region within a plurality of wavelength regions  
of different colors.

5. A liquid crystal display device using a hologram,  
characterized in that a liquid crystal display element is  
provided on a back surface side thereof opposite to a display  
surface side thereof with a diffuse reflection type hologram  
capable of diffusing and reflecting light incident from a

specific direction only in a direction defined as a viewing region.

6. The liquid crystal display device using a hologram according to Claim 5, characterized in that a diffuse

5 reflection plate or a reflector plate is located on the back surface side of the diffuse reflection type hologram.

7. The liquid crystal display device using a hologram according to Claim 5 or 6, characterized in that when a TN liquid crystal cell is used as the liquid crystal display element, the diffuse reflection type hologram enables diffuse reflection to occur within a range wherein the contrast of the liquid crystal cell is at least 2.

8. The liquid crystal display device using a hologram according to Claim 5 or 6, characterized in that when an STN liquid crystal cell is used as the liquid crystal display element, the diffuse reflection type hologram enables diffuse reflection to occur within a range wherein the contrast of the liquid crystal cell is at least 2.

9. The liquid crystal display device using a hologram according to Claim 5 or 6, characterized in that when a TN liquid crystal cell is used as the liquid crystal display element, the diffuse reflection type hologram enables light incident thereon from above and at an angle of about  $20^\circ$  with respect to a normal line thereof to be diffused and reflected within a range defined by an upward angle about  $10^\circ$ , a downward angle of about  $40^\circ$ , and breadth-wise angles of about  $60^\circ$ .

10. The liquid crystal display device using a hologram according to Claim 5 or 6, characterized in that when an STN liquid crystal cell is used as the liquid crystal display element, the diffuse reflection type hologram enables light  
5 incident thereon from above and at an angle of about  $20^\circ$  with respect to a normal line thereof to be diffused and reflected within a range defined by an upward angle about  $20^\circ$ , a downward angle of about  $30^\circ$ , and breadth-wise angles of about  $30^\circ$ .

10 11. The liquid crystal display device using a hologram according to Claim 1, characterized in that a self-luminous type backlight unit is located on the back surface side of the diffuse reflection type hologram.

15 12. A hologram scatter plate which reflects incident light in a direction different from a direct reflection direction, characterized in that a transmission type hologram layer and a back side layer are stacked together in the described order as viewed from an incident side thereof.

20 13. The hologram scatter plate according to Claim 12, characterized in that the transmission type hologram layer has both diffusion function and diffraction function while the back side layer is a mirror reflection layer.

25 14. The hologram scatter plate according to Claim 12, characterized in that the transmission type hologram layer has diffraction function while the back side layer has diffuse reflection function.

15. The hologram scatter plate according to Claim 12, characterized in that the transmission type hologram layer

both diffusion function and diffraction function while the back side layer has diffuse reflection function.

16. The hologram scatter plate according to any one of Claims 12 to 15, characterized in that the transmission type  
5 hologram layer has diffraction function, or diffusion function and diffraction function, with respect to a plurality of different wavelengths.

17. A liquid crystal display device, characterized by having the hologram scatter plate according to any one of  
10 Claim 12 to 16 located on a back surface side of a liquid crystal display element.

18. A diffuse reflection type hologram replication process, characterized in that while a photosensitive material film is slid on a fixed diffuse reflection type  
15 hologram plate in contact relation thereto, the hologram plate is irradiated from the photosensitive material film with a light beam of linear shape in section that becomes wide in a widthwise direction of the film, so that a diffuse reflection type hologram can be continuously recorded in the  
20 photosensitive material film by interference of the incident light beam with a light beam reflected and diffracted by the diffuse reflection type hologram plate.

19. The diffuse reflection type hologram replication process according to Claim 18, characterized in that the  
25 diffuse reflection type hologram plate is fixed on the surface of a transparent rod-like member rounded at at least both edges thereof.

21. The diffuse reflection type hologram replication process according to any one of Claims 18 to 20, characterized in that a combined index matching and lubricating liquid is contained between the diffuse reflection type hologram plate and the photosensitive material film.

22. The diffuse reflection type hologram replication process according to any one of Claims 18 to 21, characterized in that the light beam of linear shape in section is a light beam that diverges in a linear direction thereof alone.